PRODUCT UPDATE

MachineLibrary™ – A Wealth of Malfunction Diagnosis Information that Fits on a Single CD

Effective management of rotating machinery requires that the symptoms and fundamental causes of malfunctions be well understood. Bently Nevada's comprehensive multimedia training CD-ROM, MachineLibrary™, newly expanded with Release 2, is an excellent resource for such understanding. The following excerpt, taken from one of several articles in MachineLibrary™, demonstrates how the well-illustrated and easily read articles make learning approachable and effective for anyone.

INTRODUCTION TO MISALIGNMENT

What Is Misalignment?

To understand the concept of misalignment, first we have to define alignment. Perfect *internal* alignment exists when the centers of all of a machine's bearings, interstage diaphragms, and seals are located on the same line and that line is the centerline of the machine (Figure 1). Two machines would be in perfect *external* alignment if the centerlines of their shafts were on the same line (Figure 2, top). In practice, some degree of internal and external misalignment always exists. Flexible couplings are designed to accommodate a certain amount of misalignment, and that amount will depend on the type of coupling being used. When the misalignment exceeds the allowable tolerances for the coupling in use, the machines are said to be misaligned.

There are two basic types of external misalignment. Parallel misalignment occurs when the centerlines of two machines have the same angular orientation, but are separated from each other (Figure 2, middle). Angular misalignment occurs when the centerlines of two machines have different angular orientations (Figure 2, bottom). The most common situation is a combination of parallel and angular misalignment.

An additional type of "misalignment" involves the correct axial position of two machines that are coupled together. The tolerance for axial position for two machines will depend on the type of coupling that is used. Rigid couplings have a very low tolerance for axial position errors, while disk pack and diaphragm couplings have somewhat more, but still small, tolerance for error. Gear couplings have a higher tolerance for axial position errors.

Misalignment is a three-dimensional problem. Each machine has a centerline that exists at some orientation and position in space, and the centerline of an adjacent machine will have a different orientation and position. To make external alignment problems easier to solve, the three-dimensional centerlines of the machines are projected on two perpendicular planes (Figure 3). Then, the alignment problem can be treated as two, separate, two-dimensional problems.

The article continues with similar descriptions of the causes, symptoms, and other problems related to misalignment. Additional Malfunction Diagnosis topics addressed include fluid-induced instabilities, rubs, unbalance, shaft cracks, and rolling element bearing faults.

The Malfunction Diagnosis articles comprise only a small portion of MachineLibrary™; there is much more, making it a genuine reference library on a single CD-ROM. For more information about MachineLibrary™, please refer to the Fourth Quarter 1999 ORBIT article, *A New Version of MachineLibrary Multimedia Training Package is Now Available*, pp. 66-67, or visit the MachineLibrary™ page at our website, www.bently.com.

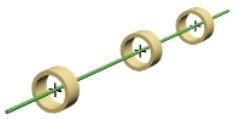

Figure 1. Perfect internal alignment exists in a machine when the centers of all of the internal parts are collinear.

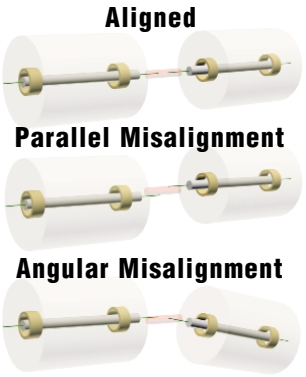

Figure 2. Two machines are in perfect external alignment (top) when their shaft centerlines are collinear within an allowable tolerance zone (red). With parallel misalignment (middle) the shaft centerlines are offset, but parallel. With angular misalignment (bottom), the shafts are oriented at different angular orientations in space. Misalignment usually involves a combination of parallel and angular misalignment. In the figure, the shafts are shown centered in the bearings. In reality, gravity loaded shafts would rest in the bottom of the bearings with the machines off.

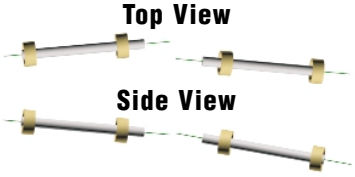

Figure 3. The 3-dimensional misalignment problem is usually broken down into two 2-dimensional problems.